SALARY SURVEY: Salaries Increase A Paltry 4.7% *page 36*

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DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

OS/2

PRODUCT PREVIEW

Inside The New OS/2

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IBM's Shon Saliga (left), OS/2 2.0 development leader, with Lori Brown (right), OS/2 Workplace Shell designer

The PC Big 10
page 42

Portable PCs Get Colorful

Making Windows Network-Friendly

Bulletproof Software Contracts
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Control Your Data Center

New Ways to Distribute Mainframe Storage
page 67

COMPARED

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DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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COVER STORY

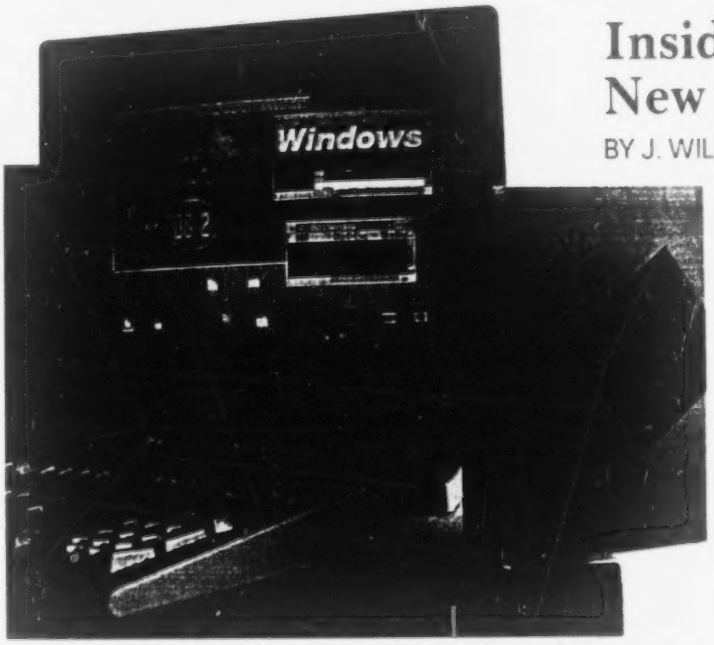
PRODUCT PREVIEW

Inside The New OS/2 26

BY J. WILLIAM SEMICH

Is IBM's new OS/2 2.0 really the advanced do-it-all operating system the company claims it to be? You decide. Here's an exclusive preview of the product IBM says will ship to users early next year.

Cover photography by Jim Kamp



IBM's new OS/2 2.0 is three operating systems in one box—OS/2, DOS 5.0 and Windows.

EXCLUSIVE

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BY ANN DOOLEY

The recession whacked IS salary increases in 1991 down to their lowest levels in five years. But don't worry. With the right skills, you can still rake it in.

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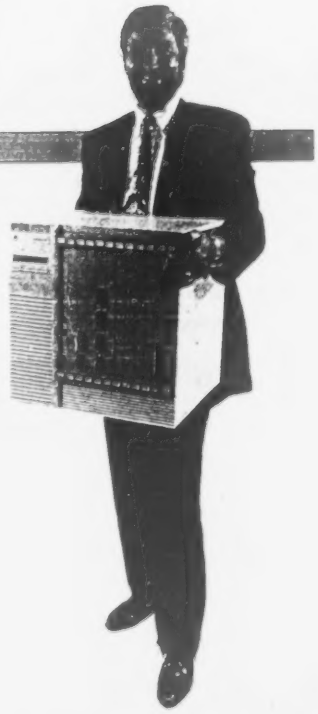
BY ELIZABETH LINDHOLM

3Com Corp.'s LinkBuilder 3GH offers scalable bandwidth, multiprocessing, and FDDI—right down to the desktop.



3Com's LinkBuilder 3GH provides FDDI performance using Ethernet personal LANs, says product manager Rohlman.

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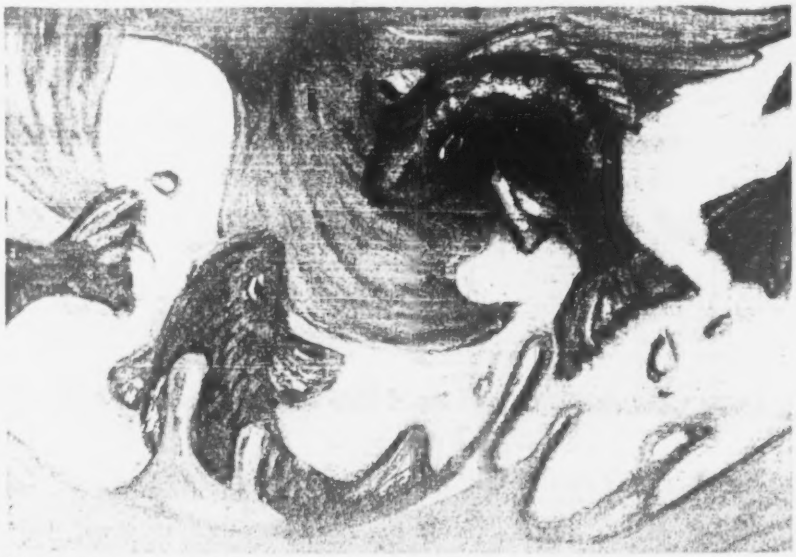

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EXCLUSIVE
SALARY SURVEY

Salaries Increase A Paltry 4.7%

The recession whacked IS salary increases in 1991 down to their lowest levels in five years. But don't worry. With the right skills, you can still rake it in.

BY ANN DOOLEY

A tough economic climate combined with ongoing downsizing and consolidations have made 1991 a rough year to be employed in the information-processing profession. IS professionals are facing the toughest market in recent memory for jobs and salaries. And they are being confronted with vastly different demands from their employers than they've known in the past. What's more, no turnaround is in sight in what has become a buyer's market for computing talent.

In fact, this year will likely go into the record books as one IS would like to forget—quickly. In 1991, the profession has been dealt a one-two punch: smaller raises than the overall national average and a decline in total MIS DP employment levels. Most firms did give their IS employees more money in their paychecks, but the amounts were smaller than the usual 5.5 to 6% increases that have been standard issue over the past five years. And in some companies IS professionals were struck by wage freezes or even decreases in their salary scales.

As a result, DATAMATION's 1991 IS Salary Survey has found the average overall IS salary increase in 1991 to be only 4.72%, down from 5.6% last year. Yet the overall national wage increase for all U.S. professions was 5.3%, down from 5.5% last year, according to William M. Mercer Inc., a New York City-based compensation and benefits consulting firm. Mercer projects a 5.2% average salary increase in 1992 based on expected small increases in the cost of living and a slowly rebounding U.S. economy.

Adding to the woe is a 5.6% drop in overall U.S. MIS DP employment levels, continuing the trend recorded in the 1990 DATAMATION Salary Survey, when the work force declined by 2.3%. All 11 industry segments specified in this year's survey reported a decline in total MIS DP employment levels. The number of temporary IS employees, including part-time and contract personnel, is down this year, too, compared with last, indicating that companies are expecting more from their on-staff personnel.

One Step Ahead Of The Bill Collectors

Even though IS didn't fare as well this year as other professions did, it beat the rising cost of living. With the 1991 Consumer Price Index at 2.7%, average IS salaries grew 2.1% in real terms.

This year's annual salary survey examined IS professionals by region, industry and company size in relation to 23 different technical titles. Much of the change in salary levels can be attributed to regional economic factors, within the context of the recession as a whole. New England, for example, which was hardest hit by the downturn, is offering lower than usual increases for IS professionals.

And the fate of specific geographic regions is often closely linked to the industries that reside there. The New England region has been particularly hard hit by the recession due in part to its economic dependence on the financial, defense and minicomputer markets. Boston, which historically has a high cost of living but not necessarily a correspondingly high salary structure, received one of the lowest average salary increases for IS as a group at 3.57%, according to the DATAMATION survey. The place where IS salaries went up the most was the Dallas–Houston–Fort Worth area, where the average IS employee received a 6.77% raise.

Although the rate of increases has slowed and may not substantially improve next year, there is still

Whoops! Average Salary Increases Tumble

The recession has pounded pay hikes to their lowest levels in five years.

Source: DATAMATION Salary Survey

Daniel Gudera illustration

Average Salary By Major City (in $)

Title	Average Weighted Salary	Boston	N.Y.C.	Wash. D.C.	Chicago	Dallas	San-Fran.	Los Angeles	Tampa
IS MANAGEMENT									
CIO / VP	106,864	117,045	117,143	100,000	107,353	132,083	133,409	124,443	78,873
Manager/Supervisor	65,811	81,842	75,000	60,714	62,500	74,286	78,421	73,103	50,379
END-USER SUPPORT									
Manager End-User Computing	56,808	57,500	58,889	58,571	57,143	63,500	63,333	61,389	43,906
Information Center Manager	54,346	51,667	53,750	52,105	46,000	58,125	59,375	68,077	47,500
PC Specialist Support	38,068	39,000	46,667	36,875	33,182	45,833	49,615	42,727	30,727
LAN Manager	45,880	48,571	48,333	46,563	51,250	43,182	61,429	46,923	41,452
WP Supervisor	36,538	37,000	41,875	32,500	35,000	32,500	40,000	43,000	36,053
SYSTEMS ANALYSIS/PROGRAMMING									
Manager	65,357	65,357	71,500	60,417	72,333	64,412	74,211	67,174	56,628
Senior Systems Analyst and Programmer	50,345	48,000	55,000	46,875	50,312	49,444	60,238	55,417	45,182
Systems Analyst and Programmer	43,220	42,000	43,333	40,000	44,167	41,154	49,000	46,346	42,019
Intermediate Analyst and Programmer	37,517	36,250	36,250	36,591	38,000	37,188	43,333	41,579	32,727
Junior Analyst and Programmer	30,156	28,750	26,667	28,333	30,769	30,000	37,000	33,333	24,318
APPLICATION/OPERATING SYSTEMS PROGRAMMING									
Manager	64,481	65,000	76,250	61,500	73,636	58,929	71,765	68,636	53,514
Senior Applications/Operating Sys. Prog.	52,434	51,000	53,636	50,833	56,500	50,714	61,250	55,750	46,951
Applications/Operating Sys. Prog.	44,419	44,615	48,182	41,000	43,000	46,000	48,182	48,824	40,000
Intermediate Applications/Operating Sys. Prog.	37,150	37,000	35,909	37,188	35,714	36,667	43,000	41,250	31,563
Junior Applications/Operating Sys. Prog.	29,709	31,667	25,000	29,615	35,000	30,000	35,000	36,538	20,588
DATA COM/TELECOM/CONNECTIVITY									
Network Manager (LAN-WAN)	57,546	58,333	76,111	52,692	68,000	53,077	62,778	61,471	48,333
Telecommunications Manager	57,136	55,000	59,375	50,909	60,625	64,500	61,875	64,333	48,966
Communications Specialist	42,276	41,250	49,444	37,500	41,875	46,818	41,667	48,250	36,719
DATABASE									
Database Manager/Administrator	61,077	66,818	72,143	56,765	67,500	58,125	63,500	67,381	51,774
Database Analyst	48,194	48,182	55,000	44,286	45,625	47,500	55,000	54,167	42,727
Microcomputer/Workstation Manager	44,500	50,000	44,286	37,000	47,500	40,000	47,500	50,500	40,000

money to be made in IS, with some top IS pros earning well into the six figures. The average salary of the Chief Information Officer or Vice President of IS is nearly $107,000. Silicon Valley paid the highest average salaries for that title, $133,409, whereas the Tampa/Orlando/Miami area paid the lowest at $78,873.

How Big Are The Big Bucks?

Other top earners were IS Managers, who received an average salary of $65,811 nationally; Manager Of Systems Analysis And Programming, earning an average of $65,357 this year; Manager Of Applications/Operating Systems, pocketing some $64,481; and Database Manager/Administrator, pulling down $61,077.

In addition to salary changes, DATAMATION's 1991 Salary Survey also examined employee benefits and here, too, found evidence of hard times. Benefits involving immediate financial payouts to employees decreased. Although long-term benefits like profit-sharing and pensions, for instance, stayed at similar levels to those of last year, the amount of medical and dental benefits, bonuses, overtime and use of a company car declined.

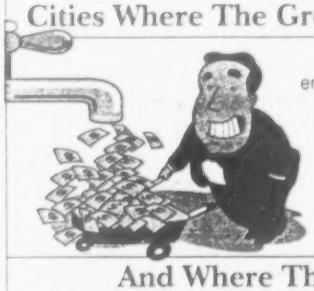
Interestingly, companies seem willing to spend more on what could be called preventive medicine. Spending for recreational facilities stayed even with 1990 levels and expenses for fitness and health programs increased 12%.

A worrisome statistic was a 5.6% drop in tuition reimbursements from 1990's level at a time when the need for IS professionals to stay on top of the technology and the business has never been greater.

Figures for this year's DATAMATION Salary Survey confirm a truth that has been much discussed in IS circles. But it's one that IS people may not have been entirely successful in adjusting to: that the future lies with the IS professionals who have combined their technological prowess with business savvy and communications skills.

Says James Weatherbee, professor and director of the MIS Research Center at the University of Minnesota: "The happy go lucky COBOL programmer is

Cities Where The Greenbacks Are Flowing...



The U.S. cities where IS employees enjoyed the highest average percentage pay increases in 1991:

Dallas/Houston/Fort Worth 6.77%
Chicago 6.08%
Los Angeles 5.96%

And Where The Spigot Is Tight

The cities with the lowest average percentage increases in 1991:

Washington, D.C. 3.49%
New York 3.50%
Boston 3.57%

Source: DATAMATION Salary Survey

Daniel Guidera Illustration

The future is for the IS professional who is aggressive and excited about the profession and technology.

going to be in trouble." IS can't afford to get stuck in time with a status quo attitude or skills. The future is for the IS professional who is aggressive and excited about the profession and technology and always interested in moving up the learning curve, Weatherbee says.

One company that is intent on having its IS employees continually move up that learning curve is Avery Dennison Corp., a manufacturer of labels based in Pasadena, Calif. Ron Claude, director of management systems in the corporate office, says that, to keep competitive, corporate IS is pilot testing a new wage scale that rewards both technical and managerial excellence.

Companies seem willing to spend more on what could be called preventive medicine.

"People are paid based on how quickly they learn and adapt versus how well they can do what they learned years ago," says Claude. "We're willing to pay for key business strategies in a nontraditional way by matching the pay structure against business need. We're insisting that everyone learn new skills and will lower the salary for those who remain in the old mold. So far, the response has been positive. Everyone owes it to themselves to improve or it's a lose/lose situation for themselves and their company."

The impetus to learn new skills is a result of certain business and technological trends that are not recession related, in particular downsizing. Bill Cooke, senior business architect in information management at a major insurance company in the Northeast, says his firm is downsizing as a result of normal expense management, which is an ongoing corporate concern, irrespective of the recession. Cooke says his firm is moving toward use of computer-aided software engineering tools and away from its formerly large pool of COBOL programmers as it retools for the future. "Knowing one thing just isn't going to hack it," says Cooke.

What's In Store

But other IS pros caution that the desire to learn new skills should be done wisely, and that IS professionals should resist the temptation to deepen their knowledge about a particular technical area in favor of gaining broader skills. Kavin Moody, former corporate director of MIS at The Gillette Co. and former director of systems management at the First National Bank Of Boston Corp., advises that overspecialization could impede movement to other companies or industries.

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Average Salary By Industry (in $)

Title	Average Weighted Salary	Mfg./ Consumer	Mfg./ Industrial	Banking	Other Financial Services	DP Services	Wholesale Distribution	Govern-ment	Me Le
IS MANAGEMENT									
CIO / VP	106,864	128,011	100,741	124,318	109,130	157,500	130,000	71,731	64
Manager/Supervisor	65,811	83,333	74,821	76,500	67,143	60,000	57,143	51,739	42
END-USER SUPPORT									
Manager End-User Computing	56,808	74,167	62,667	57,500	58,500	55,000	48,750	53,750	
Information Center Manager	54,346	56,667	60,833	56,818	53,500	63,333	49,000	47,500	4
PC Specialist Support	38,068	40,000	48,077	39,211	36,250	37,000	38,636	33,455	2
LAN Manager	45,880	55,000	52,857	46,000	45,000	52,000	52,000	42,500	4
WP Supervisor	36,538	55,000	42,500	32,500	34,000	40,000	34,000	36,667	4
SYSTEMS ANALYSIS/PROGRAMMING									
Manager	65,357	83,182	63,913	68,611	64,286	80,354	72,000	55,294	4
Senior Systems Analyst and Programmer	50,345	50,714	53,333	52,143	51,471	56,250	52,000	45,526	
Systems Analyst and Programmer	43,220	44,000	43,462	45,250	42,647	38,750	41,455	38,571	
Intermediate Analyst and Programmer	37,517	40,000	38,571	37,750	38,000	38,125	40,000	31,316	
Junior Analyst and Programmer	30,156	28,750	35,714	30,000	27,143	32,500	30,625	27,500	
APPLICATION/OPERATING SYSTEMS PROGRAMMING									
Manager	64,481	79,000	67,867	68,529	71,765	58,750	66,667	53,333	
Senior Applications/Operating Sys. Prog.	52,434	55,000	55,938	52,353	56,000	55,000	53,125	47,105	
Applications/Operating Sys. Prog.	44,419	48,571	46,250	46,176	46,563	46,429	40,000	37,500	
Intermediate Applications/Operating Sys. Prog.	37,150	42,500	40,000	35,000	38,636	35,000	37,500	33,571	
Junior Applications/Operating Sys. Prog.	29,709	30,000	32,500	29,615	30,455	30,000	28,750	23,125	
DATA COM/TELECOM/CONNECTIVITY									
Network Manager (LAN-WAN)	57,546	63,750	59,643	59,643	72,800	57,222	58,333	49,231	
Telecommunications Manager	57,136	58,750	66,111	59,231	67,500	63,125	60,000	46,429	
Communications Specialist	42,276	37,000	43,000	41,667	46,818	40,000	43,750	36,786	
DATABASE									
Database Manager/Administrator	61,077	71,000	60,500	64,643	70,385	52,500	62,000	51,786	
Database Analyst	48,194	52,000	55,000	46,000	51,250	42,500	47,500	42,143	
Microcomputer/Workstation Manager	44,500	35,000	55,000	46,818	43,750	47,500	43,750	43,000	

Although Moody and many others like him are still able to plan their own course up the career ladder, IS is no longer marked by the high turnover rates that once characterized the profession. Far fewer people are job hopping—voluntarily anyway.

IS professionals previously had the reputation of being nomads, hopping from one job to the next, moving from one region of the country to the next or changing from one industry to another, says Steve McMahn, managing director of the Boston office of national computer recruiting specialist Source EDP. But turnover rates were going down prior to the recession. Although people are still more loyal to the IS profession than to their specific industries, this may no longer be the best orientation, he believes.

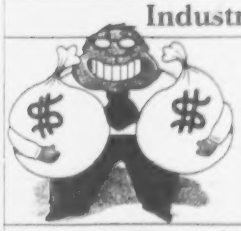
For the future, IS professionals need to recognize that many companies are reluctant to retrain existing employees in today's buyer's market and would rather hire or retrain people who don't have too much mainframe baggage. The mainframe jobs won't disappear, but the opportunities will decrease and the possibility of advancement will quickly recede, McMahn says. And salaries won't increase if there's a large pool of workers to maintain increasingly automated mainframe equipment.

The technologies to focus on are cooperative processing, client/server, LAN software, PC operating system software, UNIX and object-oriented programming, he advises.

As employment requirements continue to change, some people are going to displaced. But those that can adapt and learn new skills will reap new rewards. ▭

Ann Dooley is a freelance writer based in Framingham, Mass.

Industries With The Right Stuff...



The industry sectors that gave out the highest raises in 1991:

Financial Services 7.86%
Wholesale/Retail Distributors 7.11%
Banking 4.30%

And Those With Less Of It

The industry sectors that gave out the lowest pay hikes in 1991:

Education 1.56%
Medical/Legal Services 3.67%
Industrial Manufacturing 3.79%

Source: DATAMATION Salary Survey

Daniel Guidera illustration

Wholesale Distribution	Govern-ment	Medical Legal	Trans. / Utilities	Education	Construction Mining	Other	Average Salary By Company Revenue ($ Millions) >$250	$250-$500	$500-$5,000	$5,000-$20,000	$20,000+
130,000	71,731	64,500	114,167	103,571	76,667	101,600	82,292	84,697	104,844	128,780	129,700
57,143	51,739	42,500	66,667	51,250	52,000	65,104	50,204	61,094	68,534	75,811	73,269
48,750	53,750	-	63,462	49,000	43,750	54,310	47,200	46,667	58,871	62,593	60,857
49,000	47,500	40,000	61,364	46,000	-	51,500	43,529	46,250	56,957	60,741	56,071
38,636	30,455	27,143	41,071	31,429	30,000	38,250	36,053	31,600	39,405	40,429	40,833
52,000	42,500	40,000	44,500	34,000	40,000	45,833	42,368	46,667	48,519	46,250	45,172
34,000	36,667	40,000	40,000	25,000	25,000	38,846	32,500	40,000	36,667	39,235	37,000
72,000	55,294	40,000	67,105	50,000	62,500	65,814	58,958	53,421	65,288	71,216	68,261
52,000	45,526	40,000	52,750	40,000	45,000	49,375	46,935	46,250	49,500	53,784	52,843
80,455	38,571	35,000	42,727	32,500	40,000	41,867	45,000	39,464	42,750	43,553	44,592
40,000	31,316	25,000	39,000	32,500	40,000	38,448	35,000	38,333	38,256	36,250	38,500
26,875	27,500	25,000	36,313	25,000	25,000	28,913	32,500	31,000	28,529	28,750	31,667
66,667	53,333	47,500	66,875	47,500	62,500	62,027	51,667	51,250	66,395	70,789	68,889
53,125	47,105	-	56,875	45,000	47,500	50,286	43,947	46,667	52,391	55,429	57,206
40,000	37,500	40,000	47,000	35,000	55,000	43,500	41,500	37,273	44,390	45,571	46,562
37,500	33,571	-	38,846	32,500	-	36,250	40,000	30,455	38,448	35,556	39,444
28,750	23,125	-	37,273	25,000	25,000	26,875	30,000	26,875	30,192	29,038	31,176
58,333	49,231	47,500	58,750	40,000	55,000	60,000	46,154	51,667	54,630	60,000	64,500
60,000	46,429	-	54,231	43,750	55,000	55,556	41,538	48,333	57,000	62,258	61,852
43,750	36,786	-	49,000	36,250	56,000	41,071	39,000	33,182	39,189	45,625	47,857
62,000	51,786	-	69,000	55,333	70,000	65,962	47,778	51,364	60,000	66,818	66,765
47,500	42,143	-	50,000	40,000	55,000	46,136	46,000	46,429	46,207	48,500	50,781
43,750	43,000	40,000	47,500	40,000	-	36,846	35,714	43,750	45,000	44,412	47,941

THE PC BIG 50 1990

A handful of world-class suppliers builds and ships the vast majority of PCs sold worldwide. But a large school of smaller fish is playing a direct-marketing game that some users find hard to resist.

BY PAUL PINELLA

In the 10 years following the introduction of the IBM PC, the personal computer has blossomed into a megabillion-dollar business that continues to redefine information systems worldwide. Today, it's difficult to tell who's *not* in the PC business. Practically every major computer company worldwide sells a PC product line of some kind, as do literally hundreds of smaller firms.

In an effort to pinpoint who's on top, DATAMATION recently surveyed several hundred computer companies of all sizes. A form was sent to the chief financial officer, controller or marketing contact at each company's U.S.-based office. It asked for 1990 corporate revenue figures, PC revenues, number of

DATAMATION's Big 50 PC Companies (Worldwide)

1990 RANK	COMPANY	1990 PC REVENUE	1990 IS REVENUE	% PC REVENUE	1990 IS EMPLOYEES	IS REVENUE EMPLOYEE	CIRCLE NO.	1990 RANK
1	IBM	$9,644.00	$69,020.00	14%	373,816	$184,636	250	26
2	Apple Computer Inc.	$3,845.80	$5,740.00	67%	14,328	$400,614	251	27
3	NEC Corp.††	$3,620.00	$13,407.50	27%	37,700	$355,637	252	28
4	Compaq Computer Corp.	$3,598.00	$3,598.00	100%	11,300	$318,407	253	29
5	Toshiba Corp.§	$2,486.30	$5,169.20	48%	71,921	$71,873	254	30
6	Ing. C. Olivetti & Co. SpA	$1,791.70	$6,414.50	28%	53,679	$119,497	255	31
7	Fujitsu Ltd.	$1,419.60	$14,198.20	10%	N/A	N/A	256	32
8	Unisys Corp.	$1,181.00	$9,302.00	13%	69,200	$134,422	257	33
9	Compagnie Des Machines Bull #	$1,142.30	$6,248.60	18%	N/A	N/A	258	34
10	Commodore International Ltd.	$995.70	$995.70	100%	3,200	$311,156	259	35
11	Intel Corp.	$950.00	$950.00	100%	N/A	N/A	260	36
12	Tandy Corp.	$850.30	$1,214.70	70%	N/A	N/A	261	37
13	Acer Inc.**	$799.60	$151.80	53%	5,711	$131,601	262	38
14	Hitachi Ltd.	$718.40	$9,604.10	7%	N/A	N/A	263	39
15	Siemens Nixdorf Informationssysteme GmbH	$717.20	$8,609.00	8%	51,132	$168,375	264	40
16	AT&T	$700.00	$2,900.00	24%	11,400	$254,386	265	41
17	Seiko Epson Corp.##	$696.20	$1,590.70	40%	N/A	N/A	266	42
18	Hewlett-Packard Co.	$625.00	$9,300.00	7%	91,000	$102,198	267	43
19	NV Philips' Gl.	$600.00	$3,283.90	18%	14,970	$219,365	268	44
20	Dell Computer Corp.	$546.20	$546.20	100%	1,863	$293,183	269	45
21	AST Research Inc.	$516.20	$586.50	88%	2,512	$253,676	270	46
22	CompuAdd Corp.*	$515.60	$515.60	100%	1,500	$343,733	271	47
23	Packard Bell*	$500.00	$509.00	100%	1,500	$339,333	272	48
24	Amstrad PLC	$499.10	$518.70	96%	1,076	$482,063	273	49
25	NCR Corp.	$444.00	$5,617.00	8%	57,000	$98,544	274	50

NOTES
Revenue figures are in $ millions. IS revenues per employee figures are in $
Revenue figures have been adjusted, where necessary, to represent calendar year 1990.
* Privately held
†DATAMATION estimate

†† Includes revenues from NEC Technologies Inc.
§ Includes revenues from Toshiba America Information Systems Inc.
# Includes revenues from Zenith Data Systems
Includes revenues from Epson America Inc.
** Includes revenues from Acer America Corp.
*** Includes revenues from American Mitac Corp.

s sold
game

CIRCLE NO.	1990 RANK	COMPANY	1990 PC REVENUE	1990 IS REVENUE	% PC REVENUE	1990 IS EMPLOYEES	IS REVENUE EMPLOYEE	CIRCLE NO.
250	26	Canon Inc.	$426.80	$4,040.10	11%	N/A	N/A	275
251	27	Tandon Corp.	$418.50	$421.80	99%	1115	$378,296	276
252	28	Mitac International Corp.*	$416.00	$440.00	95%	1710	$257,310	277
253	29	Ricoh Co. Ltd.	$373.00	$2,331.30	16%	N/A	N/A	278
254	30	Wang Laboratories Inc.	$360.00	$2,363.00	15%	20184	$117,074	279
255	31	Atari Corp.	$325.70	$325.70	100%	1200	$271,417	280
256	32	Nokia Data AB	$304.50	$1,279.90	24%	7719	$165,812	281
257	33	Gateway 2000*	$275.00	$275.00	100%	1050	$261,905	282
258	34	Digital Equipment Corp.	$250.00	$13,072.00	2%	121100	$107,944	283
259	35	Everex Systems Inc.	$248.00	$427.60	58%	2597	$164,652	284
260	36	Memorex Telex NV	$213.30	$1,951.20	11%	9380	$208,017	285
261	37	Northgate Computer Systems Inc.	$203.40	$203.40	100%	697	$291,822	286
262	38	Mitsubishi Electric Corp.	$201.30	$1,830.10	11%	N/A	N/A	287
263	39	DTK Computer Inc.	$200.00	$200.00	100%	1000	$200,000	288
264	40	Goldstar Co. Ltd.	$195.50	$391.00	50%	N/A	N/A	289
265	41	Wyse Technology*	$175.00	$460.00	38%	2000	$230,000	290
266	42	Advanced Logic Research Inc.	$172.00	$172.00	100%	600	$286,667	291
267	43	Omron Corp.	$167.90	$291.30	58%	649	$448,844	292
268	44	Matsushita Electric Industrial Co. Ltd.	$164.10	$4,101.80	4%	N/A	N/A	293
269	45	International Computers Ltd.	$159.00	$2,862.90	6%	21141	$135,419	294
270	46	Tatung Co.	$150.20	$593.40	25%	3000	$197,800	295
271	47	Leading Technology Inc.	$150.00	$150.00	100%	200	$750,000	296
272	48	Triad Computer Inc.	$144.69	$144.69	100%	N/A	N/A	297
273	49	Zeos International Ltd.	$127.10	$127.10	100%	597	$212,898	298
274	50	Leo Computer Inc.*	$125.00	$125.00	100%	N/A	N/A	299
		Total PC Revenues	$45,230.19					

THE PC BIG 50 1990

employees and related information. The data resulting from this survey, along with information taken from company reports, ongoing DATAMATION research and other sources, constitute DATAMATION's first listing of the Big 50 PC suppliers.

Many of the companies are privately held and declined to reveal certain financial statistics. A number of firms keep their number of IS employees a closely guarded secret. For others, the information represents a DATAMATION estimate based on the data that were supplied. A few companies that grew amazingly fast during 1991, recession notwithstanding, simply were not in business during all of 1990 and therefore have been excluded from this study, which is based only on calendar year 1990 revenues.

Because the top 50 worldwide suppliers are, of course, not necessarily also the top suppliers into the United States, a second chart is provided of the U.S. market. This represents DATAMATION's best view of the U.S. landscape in terms of PC revenue and units shipped. Data were drawn from an ongoing survey of DATAMATION readers' purchasing patterns called the "Brand Preference Study," conducted by DATAMATION parent, Cahners Publishing Co., as well as from DATAMATION 100 research into the top 100 computer firms worldwide, company reports and other sources.

The top 50 suppliers worldwide sold over $45 billion worth of PCs in 1990. Among these 50 players, four big fish stand out: IBM, Apple Computer Inc., NEC Corp. and Compaq Computer Corp. PC sales from these four firms alone constituted a healthy 45.8% of the PC 50 market last year.

The difference in revenue between the largest supplier on the list and the smallest is wide. Number one IBM reported over $9.6 billion in PC sales compared with 50th-ranked Laser Computer Inc. which hauled in $125 million. Smaller players dominate much of the list. Only nine companies managed to crack the $1 billion barrier in PC sales. Direct marketers, mail order firms and other smaller companies make up much of the remainder.

Just being a large computer company doesn't guarantee vitality in PCs. Although IBM's success goes without saying, other mainstream computer suppliers must content themselves with a smaller piece of the pie. Digital Equipment Corp., is a good example. Digital is now taking steps to shore up its PC revenues with a bold new line of networked PCs introduced in 1991, but the company's 1990 PC revenues weigh in at a scant $250 million—peanuts compared with much smaller PC-only firms like Tandon Corp., Packard Bell and Dell.

The Smaller Fry

Part of the success of these smaller players may rest on their greater efficiencies at marketing what has essentially become a commodity item. Dell, for example, was able to thrive in 1990 through masterful marketing. By keeping both prices and head count low, Dell cracked the half-billion dollar mark while setting aside less than 1% of its revenues for research and development. This stands in stark contrast to IBM and Digital, both of which invested more than 10% of their revenues in research.

Concentrating chiefly on sales and marketing as opposed to long-term engineering, many of the companies on the Top 50 have become virtual money machines. Revenue per employee—one way to gauge productivity—has always been high at Apple and Compaq. Both of these companies earned more than $300,000 in revenue per employee during 1990. But a number of direct marketers look equally or more impressive by that measure, including Packard Bell ($833,333) and CompuAdd Corp. ($343,733).

For now, the common strategy of building reliable PCs based on Intel Corp.'s proven chip architecture seems to be working for the direct marketers. Dell, Northgate Computer Systems Inc. and Zeos International Ltd., for example, all manufacture products that often do well on user satisfaction surveys. Each has implemented support strategies by building up a base of in-house technical personnel.

How well those companies now thriving principally on price will be able to compete over the longer term is open to question. Since so many firms with look-alike products are chasing a limited number of dollars, a shakeout seems likely—particularly if the industry shifts to a new technology base, like reduced instruction set computing (RISC), that requires heavy R&D funding or a different mix of marketing channels.

—With research by Susan Moel

The U.S. PC Market

A DATAMATION estimate of U.S. PC revenues and shipments

1990 RANK	COMPANY	1990 U.S. PC REVENUE	U.S. PC UNITS
1	IBM	$3,760.00	1,200
2	Apple Computer Inc.	$2,230.00	618
3	Compaq Computer Corp.	$1,900.00	411
4	Tandy Corp.	$1,000.00	442
5	Toshiba America Information Systems Inc.†	$800.00	320
6	Unisys Corp.	$567.00	227
7	AT&T	$560.00	224
8	Zenith Data Systems*	$560.00	205
9	Intel Corp.	$529.00	212
10	Hewlett-Packard Co.	$387.00	155
11	Dell Computer Corp.	$382.00	153
12	Epson America Inc.††	$300.00	125
13	NEC Technologies Inc.§	$300.00	125
14	AST Research Inc.	$299.40	132
15	Everex Systems Inc.	$223.00	89
16	Northgate Computer Systems Inc.	$191.00	50
17	Wyse Technology	$186.25	86
18	Advanced Logic Research	$163.90	86
19	Zeos International Ltd.	$1[illegible]	[illegible]
20	Club American Technologies Inc.	$100.00	70

NOTES:
Revenue numbers are in millions; PC unit shipments are in thousands.
*Zenith Data Systems Corp./Bull SA.
†Toshiba Corp./Co.
††Seiko Epson Corp./Co.
§NEC Corp./Co.

Source: DATAMATION Brand Preference report, company reports

Japan's Lead In LCDs

Japanese electronics firms are working furiously to develop better active-matrix displays for many lucrative applications. These include laptop computers, high-definition television (HDTV), scientific/engineering workstations and medical instruments. U.S. firms, less willing to invest over the long term in the technology, are practically out of the running. While there are some U.S. companies left making flat panel displays, their products usually are not based on LCD technology. They are instead selling costly, specialized gas plasma or electroluminescent displays, mostly to the military.

This summer, the U.S. International Trade Commission (ITC) ruled that Japanese firms have been dumping flat panel displays in the United States at below-market prices, overwhelming U.S. firms that tried to compete. The ITC imposed stiff fines for importing LCDs and other kinds of flat panel displays. That will drive up the cost of imported LCD components used in laptops. It may also force U.S. laptop makers to assemble their products overseas. Indeed, Compaq Computer Corp.'s new Portable 486c laptop will be manufactured in Scotland, not Houston.

Because of their cost, flat panel displays are not likely to be used on desktop PCs until the mid-1990s. If public concern grows over radiation risks from long-term use of cathode ray tube (CRT) screens, however, flat panel alternatives could arrive sooner. The reason: flat panel displays emit far less radiation than their more conventional cousins. But, for now, the CRT remains the most economical desktop choice, despite all of its faults.

Japan's Big Bet On Flat Panel Displays

These first LCDs, known as passive-matrix LCDs, used reflected light and could be difficult to read because of low contrast and narrow viewing angles. To improve visibility, display makers added a light source behind the display—backlighting—and used "supertwisted" LCDs, which bend light at a wider angle.

A further improvement, called double supertwist, adds another layer of supertwist material, increasing contrast and providing a white image background. But additional layers of supertwist also increase the display's weight—something laptop users don't like. And even with all those improvements, supertwist LCDs can still produce poor contrast, slow response times and "ghost" images.

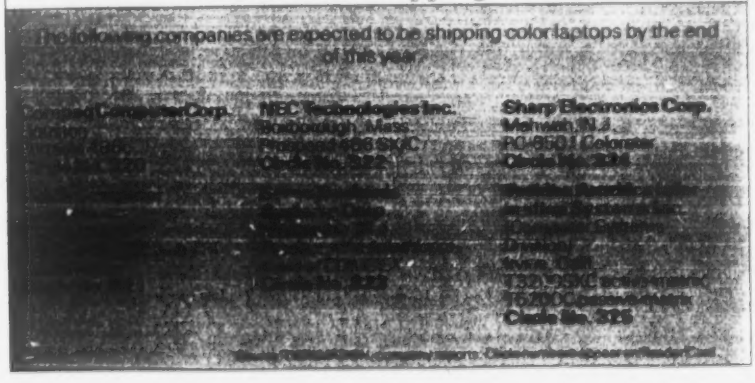
The solution was to embed three small transistors (usually thin-film transistors, or TFTs) behind each pixel, one transistor for each blue, red and green color the pixel can produce. The transistors boost power to the pixel and eliminate the need for multiplexing. When a pixel is turned on, it stays on until turned off. Each pixel can block or transmit light more fully. A much brighter backlight can also be used, producing a brighter screen and greater contrast. The result: contrast ratios as high as 100:1, about seven times brighter than the best passive-matrix LCDs.

These new active-matrix displays also have wider viewing angles (to 160 degrees or so) and faster response times (25 versus 250 milliseconds) than their passive predecessors. But they, too, are expensive. Manufacturers must apply thousands of thin-film transistors to a glass substrate to make an active-matrix panel. A total of 921,600 transistors are on the back of each new Toshiba active-matrix color display, for example. And it takes only one bad transistor or a shorted electrode pair to trash an entire active-matrix panel. That's kept production costs high and yields as low as 10 to 20%. Production has stabilized somewhat lately, but the yield problem still makes active-matrix displays costly.

Furthermore, only three companies currently make active-matrix panel displays: NEC, Sharp and Toshiba. And NEC uses its displays for the most part only in its own machines, leading to availability problems for other computer vendors. IBM and Toshiba have a two-year-old joint manufacturing venture in Japan, Display Technologies Inc., that will be producing active-matrix displays. But it hasn't started production yet.

There are some noteworthy differences among the active-matrix displays currently available, mainly in terms of color palettes and numbers of colors displayed at the two main resolutions used: 640 × 480 and 320 × 200. Of the color laptops available at press time, only the NEC Prospeed 486 SX-C and the new Compaq Portable 486c provide 256 simultaneous colors at 640 × 480 resolution. Both the high number of colors and that level of resolution are needed when an application requires the utmost in photo-realistic imaging, along with a large color palette. Some of the other displays are limited to 16 colors at higher resolutions, which is still fine for running the vast majority of applications, like, for example, Microsoft Windows.

Color Portables Shipping In 1991


The following companies are expected to be shipping color laptops by the end of this year
NEC Technologies Inc.
Sharp Electronics Corp.
Mahwah, N.J.
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MARKET INSIGHTS

AN ANALYSIS OF ECONOMIC TRENDS

Roller Coaster —Or Tailspin?

BY MADELINE FRANCHI
Cahners Economics

Whooowee—the DATAMATION Information Systems Performance Indicator (ISPI) may not be in a free fall, but it sure is beginning to feel like it. The ISPI surprised us again in late summer, falling from 92.6 in July to 92.5 in August. Although the decline was slight and came during the traditionally slower summer months, it nevertheless crushed prospects for any vast improvement by the end of the final quarter of this year.

Pent-up demand may be sitting out there, but it has yet to be unleashed. New orders for information systems equipment tumbled 5.5% from July to August and 0.6% from August 1990. This contraction alone has helped to choke the ISPI, but the steadiness of the decline is the industry's biggest problem. New orders received by U.S.-based information systems manufacturers have dropped below year-ago levels in six out of the eight months from January through August.

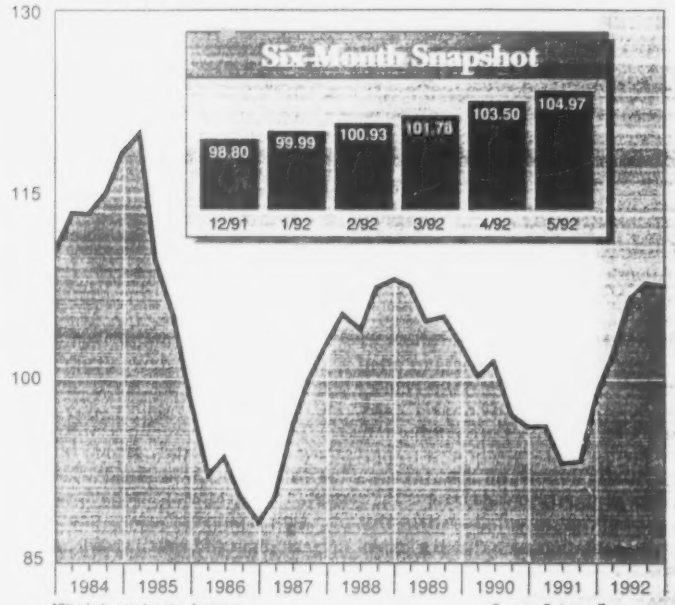
Cahners Economics expects new orders to be down in the third and fourth quarters of this year relative to 1990. That adds up to the IS industry's first annual decline in bookings since 1986 and will most likely keep the ISPI in the doldrums at least until the end of the first quarter of the new year, when we expect the IS industry to respond to capital-spending increases.

For more information on Cahners Economics's forecasting services, including seminars, newsletters and database diskettes, call Dan Buchan at (617)-630-2105, send him a fax at (617)-630-2100 or write to him at Cahners Economics, 275 Washington St., Newton, MA 02158.

Get ready for the upturn in 1992 with the "Cahners 1992 Economic Outlook." This 50+-page report features forecasts for the general economy, as well as for more than 30 industrial and service industries. Available December 15, 1991. Readers of DATAMATION can order the report, regularly $75, for only $21 by sending a check with your name and address made out to Cahners Economics, P.O. Box 59, New Town Branch, Boston, MA 02258-9908.

The IS Performance Indicator

When's the lift-off for IS?



*Shaded area denotes forecast

Source: Cahners Economics

	August 1991	July 1991	% Change 8.91-7.91	August 1990	% Change 1990/1991
■ Information-Processing Equipment					
Shipments (SA, $ billions)	9.40	9.57	-1.7	9.43	-0.3
New Orders (SA, $ billions)	8.87	9.40	-5.5	8.94	-0.6
Unfilled Orders (SA, $ billions)	27.25	27.77	-1.0	28.10	-3.0
Inventory (SA, $ billions)	15.44	15.75	-2.0	17.20	-10.2
■ Computer Production Workers					
Employment (NSA, thousands)	262.9	264.7	-0.7	277.6	-5.3
Average Weekly Hours (monthly avg.)	41.0	40.2	2.0	41.4	-1.0
■ Stock Index					
S&P's Computer Systems Stock Price Index	168.0	164.3	2.3	162.7	3.3
■ Contracts & Orders					
New Plant & Equipment (SA, $ billions)	39.1	32.0	22.4	39.9	-1.8

SA= seasonally adjusted;
NSA= not seasonally adjusted

Source: U.S. Commerce Dept., Standard & Poor's; forecasts: Cahners Economics

MARKET INSIGHTS

A SURVEY OF TECHNOLOGY TRENDS

The World's IS Wises Up To WANs

BY WARREN CHILDS AND KATHRYN A. TITO
Business Research Group

European IS operations are implementing new communications technologies at nearly the same rate as their U.S. counterparts. That's the conclusion of recent surveys by the Business Research Group of over 900 MIS professionals in *Fortune* 1,000 companies located on both sides of the Atlantic.

In Europe and the United States, for example, a strong minority of users—38% in the U.S. and 33% in Europe—are now using wide area networks to interconnect local area networks at remote sites. By using WANs to connect LANs, these users' companies are putting into place the technology required to perform client/server applications on a multisite or enterprisewide level.

Several European nations lead the U.S. in implementation of WANs. For example, 50% of users in France and 42% in Britain report using WANs to interconnect LANs. However, in European countries where the communications infrastructure is less developed (Spain) or more highly regulated and costly (Italy), WAN use is considerably lower.

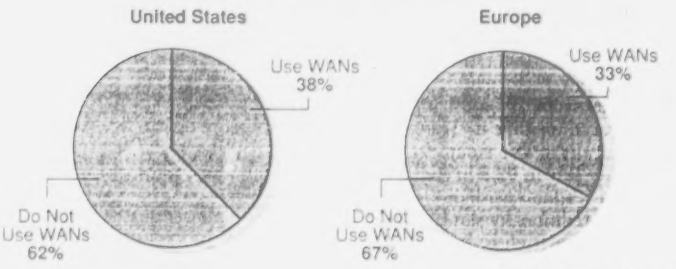
In fact, telecommunications services are not uniformly available throughout Europe and can be prohibitively expensive across borders. Most government-owned telephone companies in Europe place some additional restrictions to ensure use of the local manufacturers' telecommunications equipment regardless of cost or, in some cases, even regardless of equipment compatibility.

To reduce some of these restrictions, European LAN and WAN users are still waiting for the long-promised telecom deregulation, now slated for some time in 1992, to take effect throughout the European Economic Community. □

For more information, call Nancy Finn at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

The Worldwide Who-What-Where Of WANs

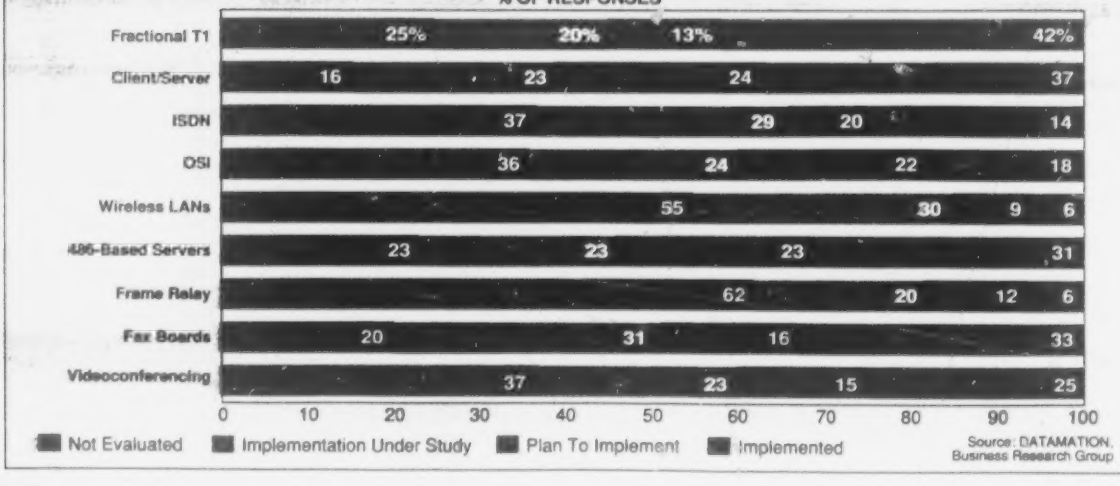
U.S. vs European WAN-LAN implementation*



* Sites with 1,000+ employees

DATAMATION's Technology Implementation Index: Networks/Communication

DATAMATION each month surveys a select group of its readers–the DATAMATION Technology Panel–to investigate the implementation of new technologies by key user organizations.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